ELECTION/RESTRICTIONS

This confirms the provisional election to prosecute the inventions defined by claims 1 – 13.

CLAIM REJECTIONS

Claims 1-3, 7 and 9 were rejected as anticipated by Ross US 4,946,656.

Claims 4 and 5 were rejected as obvious over Ross in view of Chitnis US 5,681,450.

Claim 6 was rejected as obvious over Ross.

Claim 8 was rejected as obvious over Ross in view of Lomas US 5,584,985.

Claims 10 – 13 were rejected as obvious over Ross in view of Chitnis.

THE INVENTION

The invention is a better FCC catalyst stripper, or more precisely, a better way of getting stripper vapors promptly out of the FCC unit.

Conventional FCC units typically have a riser reactor discharging into cyclones ("closed cyclones") or into some sort of catalyst disengaging device at the end of the riser and above the stripper. The stripper is used to remove the significant amount of hydrocarbons which remain on the "spent" catalyst.

Refiners have long known that the FCC stripper, or at least the "dead space" above it, is a problem in FCC units. The strippers are relatively large and the volume above the stripper is large, so it takes a long time for vapors from the stripping unit to make it out of the reactor.

The bulk of the cracked product exits quickly, especially when "closed cyclones" are used to rapidly get cracked product away and into a fractionator. The product recovered from the stripper takes a long time to be removed, in large part because of the way FCC units have evolved – they are typically large either because a lot of space has to be provided for disengaging cracked products from spent catalyst or because space has to be provided for cyclones to separated cracked products from spent catalyst.

The volume of product originating in, or rather recovered via, the catalyst stripper is relatively small – less than 1/10th of the size of the cracked vapor product directly recovered from the riser reactor. Although the volume of stripper vapors is small, the small volumes translate into a long residence time, and significant thermal cracking and deterioration.

Inventor Owen discovered that an inverted "snorkel" could be used to efficiently suck cracked product recovered via the stripper and remove it from above a conventional stripping zone in a conventional FCC reactor/stripper. Additional inventions relate to ways to suspend the "snorkel"

Having briefly reviewed the invention, the references relied on by Examiner Douglas will be briefly reviewed, with special attention given to the detailed and helpful comments on each reference provided by the examiner.

Ross et al, US 4,946,656 is directed to solving the same problem – cracking of stripper vapors in the vessel volume above the stripper. Ross "isolates" the stripper, using a "stripper cap and chimney vent …Without … (them) the stripped hydrocarbons would pass through the entire reactor vessel atmosphere to result in a longer residence time." Col. 3 lines 54 – 60.

Ross, in effect, builds a separate stripper vessel within the confines of an existing FCC unit, isolating the stripper with a stripper cap, and creating some problems, namely how to get the spent catalyst into the stripper and how to get the stripper vapors out.

In contrasting Inventor Owen's approach to that of Ross, the following differences are noted:

> Owens device does not require any changes to the stripper – an existing FCC riser reactor and stripper, "in open fluid communication with said vessel – Claim 1 Line 19) can be used.
>
> Owen does not require a cap to isolate the stripper – instead the stripper is in open fluid communication with the vessel holding the riser termination device.
>
> Owen uses the inverted snorkel, and fluid dynamics, to quickly remove stripper vapors.

Chitnis US 5,681,450 is directed to a better third stage separator – it is remote from the FCC stripper. Chitnis mentions the use of conventional cyclones, as part of a general review of cyclones, but the problem solved by Chitness was "The troublesome separation is downstream of the regenerator in the third stage separator or TSS unit. The TSS must produce gas with essentially no particles greater than 10 microns (when power recovery turbines are used) and/or achieve sufficient removal of fines.to meet emissions particulates regulatory limits." Col. 5 lines 50 – 58.

Chitnis was happy with conventional cyclones (and presumably happy with conventional strippers), and focused on getting minute amounts of sub-micron fines out of regenerator flue gas. This is both physically and conceptually remote from what goes on in the catalyst stripper using Owen's invention, where there are hundreds of tons of catalyst with a particle size of 60 – 80 microns.

A specific aspect of Chitnis' cyclone was giving gas, entrained or "aspirated" out with catalyst fines, some way to get back into the cyclone without re-entraining tiny particles of solids. If one of the tubes in Chitnis' cyclone is characterized as a snorkel, it lets gas back into the stripper whereas Owen's invention sucks vapors out of the stripper.

Lomas US 5,584,985 teaches an unusual process using vapor recovered from the cyclone diplegs as a stripping medium of sorts. Lomas teaches that "The cracked gases from the diplegs of the cyclones are particularly effective as stripping gases since they have undergone cracking to the point of being essentially inert as a result of the long residence time in the cyclone dip legs." Col. 4 lines 3 – 7. Lomas uses overcracked hycrocarbons as stripping medium - sending cracked hydrocarbons BACK to the stripper. This is the **opposite** of Owen's approach, which quickly removes cracked hydrocarbons FROM the stripper.

The above mentioned references, considered as a whole, teach away from the claimed invention rather than overlap Owen's work.

In summary:

Ross knows about conventional FCC stripping methods, with the stripper in open fluid communication with the rest of the vessel holding the riser disengaging device. Ross then isolates the stripper, putting an annular cap on it. A reference which teaches **isolating** the stripper does not anticipate or make obvious Owen's approach which can be readily **retrofitted into** a conventional FCC unit.

Chitnis directed to an improvement in the TSS unit associated with a catalyst regenerator. This is physically remote and conceptually different from the FCC stripper employed by Owen..

Lomas teaches how to get cracked product into a stripper. Lomas does not make obvious use of a snorkel to get cracked product rapidly away from a stripper. Owen's invention removes the cracked product rapidly from the stripper.

TELEPHONE INTERVIEW INVITED

If Examiner Douglas believes that patentable subject matter is present, but has concerns over claim language, a telephone interview is invited.

Respectfully submitted,

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